

**CLAIMS:**

1. A composition of matter comprising intercalated composite particles comprising a layered host material intercalated with a metal ion sequestrant having a stability constant greater than  $10^{15}$  with iron (III), wherein  
5 said sequestrant is not an alpha amino carboxylate.
2. The composition of claim 1 wherein the metal ion sequestrant has a stability constant greater than  $10^{20}$  with iron (III).
- 10 3. The composition of claim 1 wherein the metal ion sequestrant has a stability constant greater than  $10^{30}$  with iron (III).
4. The composition of claim 1 wherein said metal-ion sequestrant has a high stability constant for copper, zinc, aluminum or heavy metals.
- 15 5. The composition of claim 1 wherein the metal ion sequestrant comprises a hydroxamate functional group or a catechol functional group.
6. The composition of claim 1 wherein the metal ion sequestrant  
20 comprises a siderophore.
7. The composition of claim 1 wherein the metal ion sequestrant is acetohydroxamic acid, desferroxamine B, dihydroxamic acid, salicylic acid, catechol, disulfocatechol, dimethyl-2,3-dihydroxybenzamide, 5-sulfo-2,3-  
25 dihydroxydimethylbenzamide, mesitylene catecholamide (MECAM) and derivatives thereof, LICAMS and derivatives thereof, 4,5-dihydroxynaphthalene-2,7-disulfonic acid, and 2,3-dihydroxynaphthalene-6-sulfonic acid.
8. The composition of claim 1 wherein the host material is layered  
30 double hydroxides, hydroxy double salts, clays, or metal hydrogen phosphates.

9. The composition of claim 1 wherein the host material has a particle size of less than 1 micron.

10. The composition of claim 1 wherein the host material has a particle size of less than 0.5 micron.

11. The composition of claim 1 wherein the concentration of metal ion sequestrant is less than the exchange capacity of the host material.

12. The composition of claim 1 further comprising a polymer.

13. The composition of claim 12 wherein the polymer comprises one or more of polyvinyl alcohol, cellophane, water-based polyurethanes, polyester, nylon, high nitrile resins, polyethylene-polyvinyl alcohol copolymer, polystyrene, ethyl cellulose, cellulose acetate, cellulose nitrate, aqueous latexes, polyacrylic acid, polystyrene sulfonate, polyamide, polymethacrylate, polyethylene terephthalate, polystyrene, polyethylene and polypropylene or polyacrylonitrile or copolymers thereof.

14. An article comprising immobilized intercalated composite particles comprising a layered host material intercalated with a metal ion sequestrant having a stability constant greater than  $10^{15}$  with iron (III), wherein said sequestrant is not an alpha amino carboxylate.

15. The article of claim 14 wherein the intercalated composite particles are contained in a polymeric layer..

16. The article of claim 14 wherein the intercalated composite particles are incorporated into the materials forming the article.

17. The article of claim 14 wherein the metal ion sequestrant has a stability constant greater than  $10^{20}$  with iron (III).

18. The article of claim 14 wherein said metal-ion sequestrant has a high stability constant for copper, zinc, aluminum or heavy metals.

5                    19. The article of claim 14 wherein the metal ion sequestrant comprises a hydroxamate functional group or a catechol functional group.

                    20. The article of claim 14 wherein the metal ion sequestrant is acetohydroxamic acid, desferroxamine B, dihydroxamic acid, salicylic acid,  
10   catechol, disulfocatechol, dimethyl-2,3-dihydroxybenzamide, 5-sulfo-2,3-dihydroxydimethylbenzamide, mesitylene catecholamide (MECAM) and derivatives thereof, LICAMS and derivatives thereof, 4,5-dihydroxynaphthalene-2,7-disulfonic acid, and 2,3-dihydroxynaphthalene-6-sulfonic acid.

15                    21. The article of claim 14 wherein the host material is layered double hydroxides, hydroxy double salts, clays, or metal hydrogen phosphates.

                    22. The article of claim 14 wherein the host material has a particle size of less than 1 micron.

20                    23. The article of claim 15 wherein the polymeric layer is located on the surface(s) of the article.

                    24. The article of claim 23 wherein the polymeric layer is  
25   permeable to liquid media.

                    25. The article of claim 23 wherein the polymeric layer is permeable to aqueous media.

30                    26. The article of claim 25 wherein the polymeric layer has a water permeability of greater than  $1000 \text{ [(cm}^3\text{cm)/(cm}^2\text{sec/Pa)]} \times 10^{13}$ .

27. The article of claim 15 wherein the polymeric layer comprises one or more of polyvinyl alcohol, cellophane, water-based polyurethanes, polyester, nylon, high nitrile resins, polyethylene-polyvinyl alcohol copolymer, polystyrene, ethyl cellulose, cellulose acetate, cellulose nitrate, aqueous latexes, polyacrylic acid, polystyrene sulfonate, polyamide, polymethacrylate, polyethylene terephthalate, polystyrene, polyethylene, polypropylene or polyacrylonitrile, or copolymers thereof.

28. The article of claim 14 further comprising a barrier layer; wherein the polymeric layer is between the surface of the article and the barrier layer and wherein the barrier layer does not contain intercalated composite particles.

29. The article of claim 28 wherein the barrier layer is permeable to liquid media.

30. The article of claim 28 wherein the barrier layer is permeable to aqueous media.

31. The article of claim 30 wherein the barrier layer has a water permeability of greater than  $1000 \text{ [(cm}^3\text{cm)/(cm}^2\text{sec/Pa)]} \times 10^{13}$ .

32. The article of claim 28 wherein the barrier layer has a thickness in the range of 0.1 microns to 10 microns.

33. The article of claim 28 wherein the barrier layer comprises one or more of polyvinyl alcohol, cellophane, water-based polyurethanes, polyester, nylon, high nitrile resins, polyethylene-polyvinyl alcohol copolymer, polystyrene, ethyl cellulose, cellulose acetate, cellulose nitrate, aqueous latexes, polyacrylic acid, polystyrene sulfonate, polyamide, polymethacrylate, polyethylene terephthalate, polystyrene, polyethylene, polypropylene or polyacrylonitrile, or copolymers thereof.

34. The article of claim 28 wherein the barrier layer prevents the diffusion or passage of micro-organisms.

5                    35. A method of removing target metal-ion(s) from an  
environment comprising contacting the environment with a composition  
comprising intercalated composite particles comprising a layered host material  
intercalated with a metal ion sequestrant having a stability constant greater than  
10<sup>15</sup> with iron (III), wherein said sequestrant is not an alpha amino carboxylate.

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36. The method of claim 35 wherein the environment is a liquid medium.

37. The method of claim 36 wherein the target metal-ion  
15    concentration in the liquid medium is reduced to less than 500 ppb.

38. The method of claim 37 wherein the target metal is iron.